

Amendment and Response Under 37 C.F.R. 1.116

Applicant: Christopher L. Coleman

Serial No.: 10/607,655

Filed: July 23, 2004

Docket No.: 10030279-1

Title: DIFFRACTIVE OPTICAL ELEMENT WITH ANTI-REFLECTION COATING**REMARKS**

This Amendment is responsive to the Final Office Action mailed January 6, 2005. In that Office Action, the Examiner rejected claims 16-24 under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement. Claims 1-4 and 7-8 were rejected under 35 U.S.C. §102(e) as being anticipated by Unno et al., U.S. Patent No. 6,641,985 ("Unno"). Claim 5 was rejected under 35 U.S.C. §103(a) as being unpatentable over Unno in view of Tran et al., U.S. Patent No. 5,843,960 ("Tran"). Claims 9-11 and 15 were rejected under 35 U.S.C. §103(a) as being unpatentable over Unno. Claims 12-14 were rejected under 35 U.S.C. §103(a) as being unpatentable over Unno as applied to claim 9 above, and further in view of Tran. Claims 16-22 and 24 were rejected under 35 U.S.C. §103(a) as being unpatentable over Unno in view of Kato et al., U.S. Patent No. 6,476,968 ("Kato"). Claim 23 was rejected under 35 U.S.C. §103(a) as being unpatentable over Unno and Kato as applied to claim 16 above, and further in view of Knapp et al., U.S. Patent NO. 6,077,569 ("Knapp").

With this Response, claim 16 has been amended. Claims 1-5 and 7-24 remain pending in the application and are presented for reconsideration and allowance.

35 U.S.C. §112 Rejections

The Examiner rejected claims 16-24 under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement. The Examiner stated that:

Claim 16 has been amended to include the phrase "the substrate configured to focus infrared light". However the specification fails to teach such. The specification **only** teaches that the substrate having the diffraction grating is configured to *scatter* infrared light. One skilled in the art would understand that scattering and focusing are two completely different optical functions. (Office Action at para. no. 2, page 2) (emphasis in original).

Applicant respectfully disagrees with the Examiner's opinion that the specification of the present application fails to teach "the substrate configured to focus infrared light". With respect to the prior art conformal coating shown in Figure 2, the specification states that "the conformal coating 202 can also degrade the ability of the element 200 to focus the light in transmission." (Specification at page 4, lines 12-13). Figure 3 of the present application is a diagram illustrating a diffractive optical element 300 according to one embodiment of the

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present application, and the structure and formation of the optical element 300 is described with respect to Figures 3 and 4. The specification of the present application discloses that "[i]n one embodiment, the diffractive optical element 300 is designed for **infrared** or near-infrared light." (Specification at page 5, lines 30-31) (emphasis added). Figure 4 of the present application is a graph illustrating simulated performances of diffractive optical elements, including "**focus**" simulation results. The specification states that "[t]he '**focus**' simulation results indicate the percentage of light incident on the diffractive optical element that is properly scattered by the element (i.e., transmitted through the element and scattered in a desired direction)." (Specification at page 7, lines 6-9) (emphasis added). The specification states that "[c]urve 406 illustrates the **focus** simulation results for a diffractive optical element 300 with a top-only anti-reflection coating 302 according to one embodiment of the present invention. As can be seen from curve 406, for a zero degree angle of incidence, the element 300 with a top-only anti-reflection coating 302 properly **focuses** over eighty percent of the light incident on the element 300." (Specification at page 7, line 30, to page 8, line 4) (emphasis added). In discussing the confirmation of the simulation results by actual test results, the specification states that "[m]ore energy was **focused** in the desired direction by the element having the top-only coating than by the element with the conformal coating, consistent with the simulation results shown in Figure 4." (Specification at page 9, lines 9-12) (emphasis added).

Thus, the language used in claim 16 is supported by the specification of the present application. Applicant respectfully requests removal of the rejection of claims 16-24 under 35 U.S.C. §112, first paragraph.

35 U.S.C. §102 Rejections

The Examiner rejected claims 1-4 and 7-8 under 35 U.S.C. §102(e) as being anticipated by Unno et al., U.S. Patent No. 6,641,985 ("Unno"). Independent claim 1 includes the limitation "an anti-reflection coating formed on the surface relief pattern by a directional deposition technique, thereby forming a coated surface relief pattern with substantially the same dimensions as the surface relief pattern formed on the substrate." With respect to claim 1, the Examiner stated that Unno teaches "an *anti-reflection coating* (layer 22, in Figure 3 or multilayer 23-24 in Figure 4), formed on the surface relief pattern wherein

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the anti-reflective coating has substantially the *same dimension* or *width dimension* as the surface relief pattern, (please see column 5, lines 20-55)." (Office Action at para. no. 4, page 3). Applicant could find nothing in column 5, lines 20-55 of Unno, which was cited by the Examiner, that teaches or suggests a coated surface relief pattern with substantially the same dimensions as the surface relief pattern formed on the substrate. In the Response to Arguments section of the Office Action, the Examiner stated that "[t]he feature 'the coated surface relief pattern has substantially the same dimensions as the underlying surface relief pattern' is not in the claims and therefore cannot be relied upon to overcome the rejections." (Office Action at para. no. 11, page 9). The language "a coated surface relief pattern with substantially the same dimensions as the surface relief pattern formed on the substrate" is in claim 1, and is relied upon to overcome the rejection. Applicant respectfully submits that column 5, lines 20-55 of Unno does not teach or suggest this limitation.

The Examiner also stated that:

Claim 1 has been amended to include the feature that the anti-reflection coating formed on the surface relief pattern *by a directional deposition technique*. However, the *product-by-process limitation* is not given any patentable weight since the process "directional deposition technique" is a commonly known film deposition method in the art that does not differentiate the produce, i.e. the deposited anti-reflection coating on the surface of relief pattern, from the prior art diffractive optical element having the same structure. (Office Action at para. no. 4, page 3) (emphasis in original).

The Examiner's refusal to consider words that are used in claim 1 is contrary to established precedent. "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). "A patent applicant is free to recite features of an apparatus either structurally or functionally." *In re Schreiber*, 44 USPQ2d 1429, 1432 (CAFC 1997) citing *In re Swinehart*, 439 F.2d 210, 212, 169 USPQ 226, 228 (CCPA 1971). The Court in *Schreiber* further stated that "where the Patent Office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an inherent characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristic relied on". *Id.* In the present case, it is not inherent that the anti-reflection layer disclosed in

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Unno "is formed on the surface relief pattern by a directional deposition technique." As the Federal Circuit has stated, "[i]nherent anticipation requires that the missing descriptive material is 'necessarily present,' not merely probably or possibly present, in the prior art." *Trintec Indus., v. Top-U.S.A. Corp.*, 63 USPQ2d 1597, 1599 (Fed. Cir. 2002) (quoting *In re Robertson*, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999)). The Examiner has indicated that the anti-reflection layer disclosed in Unno could be formed by any well known standard deposition process (Office Action at para. no. 11, page 9), so it is not inherent in Unno that the anti-reflection layer is necessarily formed by a directional deposition technique.

The Examiner indicated that the language "formed on the surface relief pattern by a directional deposition technique" in claim 1 is a product-by-process limitation that should not be given any patentable weight. However, the MPEP states that:

The structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art, especially where the product can only be defined by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product. See, e.g., *In re Garnero*, 412 F.2d 276, 279, 162 USPQ 221, 223 (CCPA 1979) (holding "interbonded by interfusion" to limit structure of the claimed composite and noting that terms such as "welded," "intermixed," "ground in place," "press fitted," and "etched" are capable of construction as structural limitations.). MPEP §2113.

In this case, the specification of the present application discloses that the directional deposition technique imparts distinctive structural characteristics to the final product. For example, the specification indicates that the "top-only" coating produced by a directional deposition technique maintains the underlying surface relief pattern, which provides improved lens performance:

An explanation for the difference in lens performance between an element with a conformal coating 202 and an element with a top-only coating 302 is that the conformal coating 202 evenly coats the sides of the surface relief features (e.g., vertical surfaces 106), and thereby begins to fill in the air gap between the features, effectively reducing the presence of the features and the ability of the features to influence the light. The top-only coating 302, on the other hand, according to one form of the invention, has no smoothing effect on the surface relief features, and is able to faithfully reproduce the same surface relief pattern at its top surface. (Specification at page 8, lines 18-26).

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The Examiner has acknowledged that “Unno et al does not teach explicitly that the anti-reflective coating is *deposited directionally* via the deposition process such as sputtering.” (Office Action at para. no. 7, page 5) (emphasis in original). As discussed above, the limitation “an anti-reflection coating formed on the surface relief pattern by a directional deposition technique” is also not inherent in Unno.

In view of the above, Unno does not teach or suggest each and every limitation of independent claim 1. The Applicant respectfully requests removal of the rejection of claim 1 under 35 U.S.C. §102(e), and requests allowance of this claim. Since dependent claims 2-4, 7, and 8 further limit patentably distinct claim 1, claims 2-4, 7, and 8 are believed to be allowable over the cited reference, and allowance of claims 2-4, 7, and 8 is respectfully requested.

35 U.S.C. §103 Rejections

The Examiner rejected claim 5 under 35 U.S.C. §103(a) as being unpatentable over Unno in view of Tran et al., U.S. Patent No. 5,843,960 (“Tran”). Claim 5 is dependent on independent claim 1. As described above with respect to claim 1, Unno does not teach or suggest “an anti-reflection coating formed on the surface relief pattern by a directional deposition technique, thereby forming a coated surface relief pattern with substantially the same dimensions as the surface relief pattern formed on the substrate”, as recited in independent claim 1. Tran also does not teach or suggest this limitation of claim 1. In view of the above, dependent claim 5, which further limits patentably distinct claim 1, is believed to be allowable over the cited references, and allowance of claim 5 is respectfully requested.

The Examiner rejected claims 9-11 and 15 under 35 U.S.C. §103(a) as being unpatentable over Unno. Independent claim 9 includes the limitation “directionally depositing an anti-reflection coating on the surface relief pattern, thereby substantially maintaining dimensions of the surface relief pattern.” As described above with respect to claim 1, Unno does not teach or suggest “an anti-reflection coating formed on the surface relief pattern by a directional deposition technique, thereby forming a coated surface relief pattern with substantially the same dimensions as the surface relief pattern formed on the substrate”, as recited in independent claim 1. For the reasons set forth above with respect to

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claim 1, Unno also does not teach or suggest "directionally depositing an anti-reflection coating on the surface relief pattern, thereby substantially maintaining dimensions of the surface relief pattern" as recited in independent claim 9.

The Examiner has acknowledged that "Unno et al does not teach explicitly that the anti-reflective coating is *deposited directionally* via the deposition process such as sputtering." (Office Action at para. no. 7, page 5) (emphasis in original). However, the Examiner stated that:

Unno et al *does teach* explicitly that the underlying layer film (12) that is dielectric in nature can be deposited on the substrate using *directionally selective deposition* process via *sputtering* system, (please see Figure 2 and column 4, lines 27-37, and 55-64). It would then have been obvious to one skilled in the art to apply the explicitly teachings of deposition process and system disclosed by Unno et al to also carry out the deposition of the antireflective coating for the benefit of using the same and conventional arrangement to form the coating to save manufacturing cost. (Office Action at para. no. 7, page 5) (emphasis in original).

There is no teaching or suggestion in Unno that the deposition process for the underlying film 12 could or should be used for depositing the antireflective film 22 shown in Figure 3, or the antireflective films 23 and 24 shown in Figure 4. The antireflective films 22, 23, and 24 use different materials than the underlying film 12, and there is no teaching or suggestion in Unno regarding saving manufacturing costs by using the same process for all deposited films. There is no teaching or suggestion in Unno that the antireflective films are even compatible with the deposition equipment for the underlying film 12, which is formed from a different material than the antireflective films. Further, Unno discloses that the deposition process for the underlying film 12 corrects the errors or irregular pattern of the substrate by "planarizing" the irregular pattern. (See, e.g., Unno at col. 3, lines 12-13; col. 4, line 61, to col. 5, line 2). This disclosure teaches away from claim 9, which recites "substantially maintaining dimensions of the surface relief pattern". Rather than attempting to maintain the underlying substrate structure, Unno teaches that directional deposition is used to planarize the underlying substrate structure.

In addition, if the motivation were to simply save time and money, as suggested by the Examiner, then the deposition process disclosed in Unno would not be used for the

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antireflective film. Such a process is slow and wasteful compared to conventional plasma-assisted techniques.

In the Response to Arguments section of the Office Action, the Examiner stated that:

Although Unno et al does not teach explicitly that the layers for the antireflective coating, which are dielectric in nature, are formed by the directional deposition process, however they have to be formed by one of these well known standard deposition processes, and very likely to be formed by the process particular taught in the disclosure since it is nature for one skilled in the art to use the same deposition process for forming the layers. (Office Action at para. no. 11, page 9).

The Examiner has not cited a single reference that teaches or suggests directionally depositing an anti-reflective layer on a diffractive optical element substrate. Rather, the Examiner has relied on unsupported speculation on the "nature" of one of ordinary skill in the art and that it is "likely" that the anti-reflective film in Unno would be deposited using a directional deposition technique. This speculation ignores the reality that thin films in virtually any given device are routinely formed with different processes and different deposition equipment. The equipment and process for any given layer are chosen based on a variety of different factors.

One of the requirements of establishing a *prima facie* case of obviousness is that "the prior art reference (or references when combined) must teach or suggest all the claim limitations." MPEP §2143. Unno does not teach or suggest any deposition technique for an anti-reflection coating, let alone directionally depositing an anti-reflection coating on a surface relief pattern of a diffractive optical element substrate, as recited in independent claim 9. The Examiner's unsupported speculation fails to establish a *prima facie* case of obviousness.

In the Response to Arguments section of the Office Action, the Examiner further stated that:

Furthermore, as disclosed by the instant application, the antireflective coating can be either deposited by directionally deposition process or **any other conventional sputtering process** such as DC or RF sputtering process, (please see page 6, lines 6-19). **Applicant's own disclosure** indicates that the deposition process is *not novel* and it does not differentiate the diffractive optical element made by the process from the element made by any other conventional deposition process. The feature concerning deposition process

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therefore is not a patentable distinction. (Office Action at para. no. 11, page 10).

The Examiner has apparently misread the specification of the present application. The specification of the present application does not disclose that "the antireflective coating can be either deposited by directionally deposition process or any other conventional sputtering process", as indicated by the Examiner. For the Examiner's convenience, the cited portion of the disclosure (page 6, lines 6-19) is reproduced below:

In one embodiment, the top-only anti-reflection coating 302 is deposited at the wafer level using a directional deposition technique. In one embodiment, the top-only anti-reflection coating 302 is directionally deposited using evaporation, such as electron beam evaporation. In other embodiments of the present invention, coating 302 is directionally deposited using a sputtering technique. For example, the coating 302 may be directionally deposited using a very small magnetron sputtering target in a chamber configuration similar to that used for electron beam evaporation to provide collimation by distance and a small source. Alternatively, a conventional sputtering target can be used with a collimator positioned between the target and the substrate. For the technique using a conventional sputtering target and a collimator, the sputtering can be performed with or without a magnetron, the sputtering can be either radio frequency (RF) or direct current (DC), and the process can be either reactive or non-reactive. (Specification at page 6, lines 6-19).

There is nothing in this cited portion of the specification that discloses that the antireflective coating can be either deposited by a directional deposition process or any other conventional sputtering process. In addition, it is very difficult to see how one could come to the conclusion that Applicant's own disclosure "does not differentiate the diffractive optical element made by the process from the element made by any other conventional deposition process". Throughout the specification and drawings of the present application, Applicant has compared and contrasted an element with no antireflective coating, an element with a conformal coating formed by a plasma-assisted deposition technique, and an element with a top-only antireflective coating formed by a directional deposition technique, including a discussion of the difference in structure and performance of the different elements, and a discussion of simulation results and actual test results of the different elements. The

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Examiner is respectfully directed to Figures 1-4 of the present application and the corresponding description of these Figures.

In view of the above, the Examiner has not established a *prima facie* case of obviousness of independent claim 9. The Applicant respectfully requests removal of the rejection of claim 9 under 35 U.S.C. §103(a), and requests allowance of this claim. Since dependent claims 10, 11, and 15 further limit patentably distinct claim 9, claims 10, 11, and 15 are believed to be allowable over the cited reference, and allowance of claims 10, 11, and 15 is respectfully requested.

The Examiner rejected claims 12-14 under 35 U.S.C. §103(a) as being unpatentable over Unno as applied to claim 9 above, and further in view of Tran. Dependent claims 12-14 are dependent on independent claim 9. As described above with respect to independent claim 9, Unno does not teach or suggest "directionally depositing an anti-reflection coating on the surface relief pattern, thereby substantially maintaining dimensions of the surface relief pattern", as recited in claim 9. Tran also does not teach or suggest this limitation of claim 9. In view of the above, since dependent claims 12-14 further limit patentably distinct claim 9, claims 12-14 are believed to be allowable over the cited references, and allowance of claims 12-14 is respectfully requested.

The Examiner rejected claims 16-22 and 24 under 35 U.S.C. §103(a) as being unpatentable over Unno in view of Kato et al., U.S. Patent No. 6,476,968 ("Kato"). Independent claim 16, as amended herein, includes the limitation "an anti-reflection coating directionally deposited on the first side of the substrate, thereby forming a plurality of coated light diffracting features, the coated features each having a width dimension that is substantially the same as the width dimension of a corresponding one of the light diffracting features of the substrate." As described above with respect to claim 1, Unno does not teach or suggest "an anti-reflection coating formed on the surface relief pattern by a directional deposition technique, thereby forming a coated surface relief pattern with substantially the same dimensions as the surface relief pattern formed on the substrate", as recited in independent claim 1. For the reasons set forth above with respect to claim 1, Unno also does not teach or suggest "an anti-reflection coating directionally deposited on the first side of the substrate, thereby forming a plurality of coated light diffracting features, the coated features each having a width dimension that is substantially the same as the width dimension of a

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corresponding one of the light diffracting features of the substrate” as recited in independent claim 16.

In view of the above, Unno and Kato, either alone or in combination, do not teach or suggest each and every limitation of independent claim 16. The Applicant respectfully requests entry of the amendment to claim 16, removal of the rejection of claim 16 under 35 U.S.C. §103(a), and requests allowance of this claim. Since dependent claims 17-22 and 24 further limit patentably distinct claim 16, claims 17-22 and 24 are believed to be allowable over the cited references, and allowance of claims 17-22 and 24 is respectfully requested.

The Examiner rejected claim 23 under 35 U.S.C. §103(a) as being unpatentable over Unno and Kato as applied to claim 16 above, and further in view of Knapp et al., U.S. Patent NO. 6,077,569 (“Knapp”). Dependent claim 23 is dependent on independent claim 16. As described above with respect to independent claim 16, Unno and Kato, either alone, or in combination, do not teach or suggest “an anti-reflection coating directionally deposited on the first side of the substrate, thereby forming a plurality of coated light diffracting features, the coated features each having a width dimension that is substantially the same as the width dimension of a corresponding one of the light diffracting features of the substrate”, as recited in independent claim 16. Knapp also does not teach or suggest this limitation of claim 16. In view of the above, since dependent claim 23 further limits patentably distinct claim 16, claim 23 is believed to be allowable over the cited references, and allowance of claim 16 is respectfully requested.

CONCLUSION

In view of the above, Applicant respectfully submits that pending claims 1-5 and 7-24 are in form for allowance and are not taught or suggested by the cited references. Therefore, reconsideration and withdrawal of the rejections and allowance of claims 1-5 and 7-24 is respectfully requested.

No fees are required under 37 C.F.R. 1.16(b)(c). However, if such fees are required, the Patent Office is hereby authorized to charge Deposit Account No. 50-1078.

The Examiner is invited to contact the Applicant’s representative at the below-listed telephone numbers to facilitate prosecution of this application.

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Any inquiry regarding this Amendment and Response should be directed to either Pamela Lau Kee at Telephone No. (408) 345-8941, Facsimile No. (408) 345-3063 or Jeff A. Holmen at Telephone No. (612) 573-0178, Facsimile No. (612) 573-2005. In addition, all correspondence should continue to be directed to the following address:

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CERTIFICATE UNDER 37 C.F.R. 1.8:

The undersigned hereby certifies that this paper or papers, as described herein, are being transmitted via telefacsimile to Examiner Chang, Group Art Unit 2872, at Fax No. (703) 872-9306 on this 14th day of March, 2005.


By: _____
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